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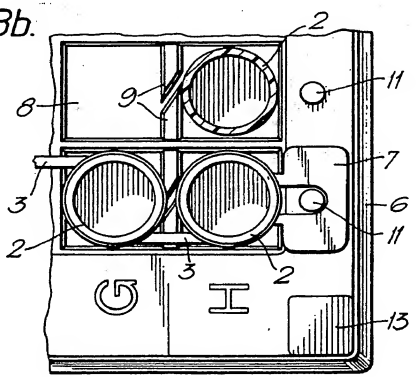
(54) **Cuvette matrix and its tray.**

(57) The invention concerns a cuvette matrix and its tray. The matrix comrises adjacent cuvettes (2) connected with one another by flexible connecting elements (3). The tray has an aperture (8) for each well, with a flexible clamping element (9).

Fig. 3b.



EP 0 415 307 A2

CUVETTE MATRIX AND ITS TRAY

This invention concerns a cuvette matrix, formed by rows, and its tray. If necessary, smaller parts of the matrix can be removed and put back into the tray. The cuvette matrix is especially suitable for use in different diagnostic measurements, f.e. for EIA-assays. Cuvette matrices can f.ex. form a so called microtitration plate.

Generally used for diagnostic assays are test plates formed by rows of cuvettes, f.ex. the so called microtitration plate into the cuvettes of which the samples are placed. Mostly used is a standard plate with 8 x 12 cuvettes with a distribution of 9 mm. Known are also cuvette sets, a smaller part of which can be removed, if necessary. Thus, it is not necessary to use the whole set, if there are only a few of the samples.

Patent publication US 4154795 discloses a micro-titration plate the wells (cuvettes) of which have been connected with one another by rigid, straight stems right by the well rows. The stems can be broken and in this way is is possible to remove a necessary amount of wells from the plate. The tray of the plate is equipped with posts placed in spaces between the wells. One problem with this solution is the fact that the wells do not stand upright in the tray properly, when the tray is moved. F.ex. during stages of washing it is often necessary to turn the tray upside down, whereby the wells tend to fall down. Even the fact that the different wells are at different heights in the tray can cause difficulties with the measuring device.

The cuvette matrix in accordance with the present invention and its tray with some of its favourable applications is disclosed in claims.

Substantial for the solution according to the invention is the fact that the cuvettes have been connected with one another with flexible connecting elements and that there are flexible clamping elements in the tray to fasten the cuvettes in place with help of the friction.

In drawings of the detailled description of the invention figures 1a and 1b show one row-formed cuvette matrix in accordance with the invention, viewed from side and above, figures 2a and 2b show one cuvette matrix tray in accordance with the invention, viewed from side and above and figures 3a and 3b show a detail of the tray in accordance with figures 2a and 2b, where the matrix in accordance with figures 1a and 1b and one of its cuvettes has been placed in, viewed from side and above.

The cuvette matrix in accordance with the invention is formed by straight rows of cuvettes, with one of them or several side by side. The matrix is advantageously made of some suitable plastic material by injection-moulding. The cuvettes are preferably cylindric cups. For optical measurements, if necessary, their bottom is transparent. The matrices are suitable for use especially in different diagnostic assays on fluid samples, f.ex. in EIA assays. If necessary, the cuvettes can be pretreated, f.ex. the content can be coated with antigen of the antibody to be assayed.

At least a part of adjacent cuvettes of the matrix have been connected with one another by flexible connecting elements, that permit the cuvettes to move a little in relation to one another, at least horizontally. The connecting elements are situated in a way that the lower part of each cuvette can be put in the aperture of the tray described later. The connecting elements are preferably like stems and they are placed to connect the cuvettes at their top part. The required flexibility is attained f.ex. by placing the stems at a distance from the centre line of the cuvette row. It is also possible to use curved stems right by the centre line.

The cuvettes are preferably connected with one another in a way that a desired amount of cuvettes can readily be removed from the matrix. The removability is preferably attained by making the connecting elements to be readily breakable.

The tray is formed by a frame with an aperture at least for one cuvette of the matrix. The aperture includes a flexible clamping element that fastens the cuyette into the aperture with help of the friction, preferably by pressing its lower part from sides. The clamping element, anyway, gives that much way that the cuvette can be pushed into the aperture. The clamping element may press the cuvette from one side or several sides. According to one embodiment the clamping element presses the cuvette against a rigid frame. The clamping element can be formed f.ex. by one or more flexible fingers. The finger is preferably flexible horizontally.

Enclosed figures 1 - 4 describe one application of the invention adapted to a micro test plate 8 x 12.

Figures 1a and 1b describe a one-row cuvette matrix 1. The single cuvettes, i.e. wells 2 thereof have been connected with one another by narrow stems 3. The stems 3 are fixed to the top part of the wells. The stems 3 are placed at a distance from the centre line of the cuvette row at sides of the cuvette row, so that the stems 3 next to each other are each in opposite sides. The stems 3 give that much way that each distance between adjacent wells 2 can get smaller and wider for some hundredths or tenths of a millimeter.

The inside of the wells 2 is cylindric. Their

bottom forms a light transmission measuring window. The window is protected against scratching with a collar around the window.

On the outer surface of the wells 2, slightly below the middle there is a shoulder 5, broader than the lower part of the well, which determine how deep the well can be pushed into the tray 6. The outer surface of the lower part of the well 2 is cone-shaped, tapered slightly downwards.

The stems 3 can be broken by hand. This enables the required amount of wells 2 to be readily removed.

In the both ends of the cuvette matrix there are flanges 7 at the top part, that can also be broken off.

In the tray 6 in accordarce with figures 2a and 2b there are 8 x 12 apertures 8, in cross-sectional shape quadratic. The side of the aperture 8 is slightly shorter than the biggest diameter of the lower part of the well 2. The apertures 8 form 8 rows, marked with letters (A - H) and 12 columns, marked with numbers (1 - 12). The apertures 8 are dellmited by a rectangular frame with separation walls perpendicular to one another.

Separation walls parallel with the columns are integral and rigid. From the second separation wall on, from the side, every other wall parallel with the rows is also integral and rigid.

From the first separation wall, from the side, every other wall parallel with the rows is cut off vertically at the centre line of the column, but diagonally against the separation wall and so that there is a small gap between the cut-off ends. The thus formed fingers 9, parallel with the separation walls of the rows, are slightly bent in horizontal direction. Thus, a well 2 can be pushed into each aperture 8, whereby the finger 9 bends away from the centre of the aperture. The finger 9 still keeps the well 2 in the aperture with help of the friction.

The upper edge of the the rigid separation walls 10 stops the shoulder 5 on the outer surface of the well 2. Also on the sides of the tray the frame has ancons against the shoulders 5.

On the side of the tray there is a pin 11 at the lower end of each column. One head flange 7 of the cuvette matrix has a corresponding hole 12. Thus, the cuvette matrix is always put the right way on the tray.

Lower edges of the tray extend lower than the bottoms of the wells 2 in the tray. Additionally, there are lips in the corners 13 of the tray to enable the trays to be readily piled.

Claims

1. Cuvette matrix with at least one line or row of cuvettes, placed in tray with space for at least one cuvette matrix, **characterized** in, that at least a part of adjacent cuvettes (2) of the matrix are connected with one another by flexible connecting elements (3) that permit the distance between the cuvettes to change a little and that each cuvette has a lower part that can be pushed into a corresponding aperture and that the tray has substantially a rectangular frame with at least one aperture matrix, corresponding the cuvette matrix, with an aperture for each cuvette of the matrix (8), where the cuvette (2) can be settled, the aperture comprising a flexible clamping element (9) that keeps the cuvette, settled in the aperture, in place with help of the friction.

2. Cuvette matrix as claimed in claim 1, **characterized** in, that it is possible to remove one cuvette or more from the matrix at a time.

3. Cuvette matrix as claimed in claim 1 or 2, **characterized** in, that the cuvette is removable by breaking the flexible connecting element (3).

4. Cuvette matrix as claimed in any of the claims 1 - 3, **characterized** in, that the connecting element is a stem (3) connecting the cuvettes with one another.

5. Cuvette matrix as claimed in claim 4, **characterized** in, that the stems (3) are in each line or row of cuvettes at a distance from the centre line of the line or row of cuvettes, in successive spaces at a different distance from the centre line or on opposite sides of the centre line.

6. Cuvette matrix as claimed in claim 5, **characterized** in, that the stems (3) in successive spaces are on opposite sides of the centre line.

7. Cuvette matrix as claimed in any of the claims 1 - 6, **characterized** in, that there is a projecting flange (5) on the outer surface of the cuvette (2).

8. Cuvette matrix as claimed in any of the claims 1 - 7, **characterized** in, that the clamping element includes at least one flexible finger (9) placed on the wall of the aperture, that presses the cuvette against the other wall of the aperture.

9. Cuvette matrix as claimed in claim 8, **characterized** in, that the finger (9) is horizontally flexible.

10. Cuvette matrix as claimed in claim 8 or 9, **characterized** in, that there is only one finger (9) for each cuvette.

Fig.1a.

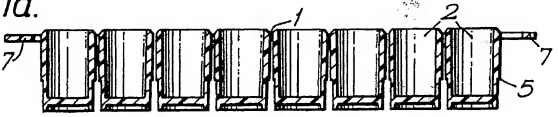


Fig.1b.

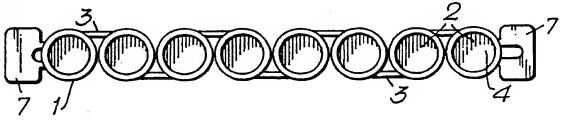


Fig.3a.

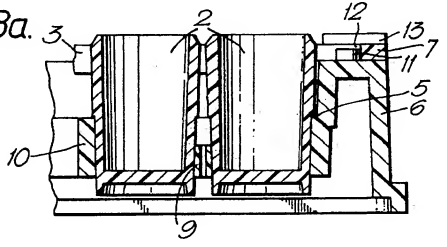


Fig.3b.

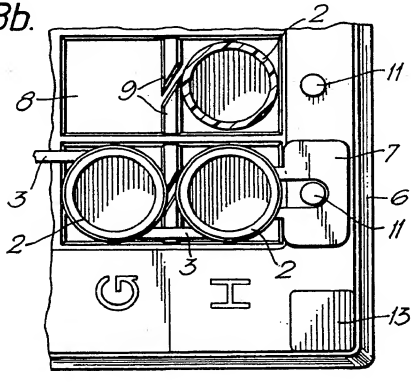


Fig. 2a.

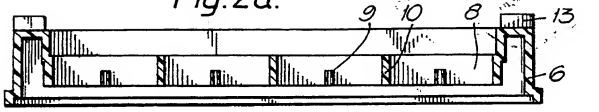


Fig. 2b.